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Research Article

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Research Article

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Abstract

BACKGROUND
Intergenerational transmission of completed fertility is widely confirmed for several societies. Less research, however, has focused on differences in the transmission effect of fertility timing and its underlying mechanisms in a regional context.

OBJECTIVE
The aim of this study is to examine the association between a mother's age at her daughter's birth and that daughter's transition to first birth in eastern and western Germany, as well as its underlying mechanisms.

METHODS
Using data from the German Family Panel (pairfam), the intergenerational transmission of fertility timing between mothers and daughters born between 1971–1973 and 1981–1983 is investigated using event history analysis. As an alternative to a mother's age at first birth, a mother's age at her daughter's birth is used to determine her daughter's transition to first birth.

RESULTS
Results show evidence for intergenerational transmission of young childbearing between mothers and their daughters in eastern and western Germany, though the association was weaker for eastern Germany. This intergenerational transmission effect cannot be explained by the measures used to capture the underlying mechanisms – socialisation, socioeconomic status transmission, and social control.

CONTRIBUTION
Our contribution to the ongoing discussion is to close a gap in research on the intergenerational transmission of fertility timing. By using the German context to analyse regional differences, we exemplify the varying strength of the intergenerational

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transmission of fertility timing between eastern and western Germany that persisted beyond reunification.

1. Introduction

The intergenerational transmission of particular characteristics and behaviours has been of key interest to social science for some time (Pearson, Lee, and Bramley-Moore 1899), and was confirmed for various aspects such as union formation (Thornton 1991), divorce (Engelhardt, Trappe, and Dronkers 2002; Wolfinger 1999), poverty (Barber 2001; Manlove 1997), and gender attitudes (Cunningham 2001). Research has also consistently found intergenerational transmission of fertility behaviour from parents to their children across countries (Barber 2001; Murphy 1999; Murphy and Knudsen 2002). Moreover, while previous studies have established the effect of parent's fertility timing and number of children on their children's fertility patterns, they have also focused on the underlying mechanisms. However, contextual differences remain underexplored; hitherto, no studies have compared regional variation in intergenerational transmission of fertility timing.

A better understanding of contextual differences in intergenerational transmission of fertility patterns is important for two reasons. Firstly, in recent decades a change in the meaning of family took place, mainly explained by the individualisation of life forms (Beck 1992). The importance of a family varies by society due to cultural and structural context. These contexts can increase or weaken the association between a parent's and their child's fertility patterns (Fasang 2015). In societies with strong family ties, intergenerational transmission has shown to be higher (Engelhardt, Trappe, and Dronkers 2002; Murphy and Knudsen 2002). Secondly, the continuity of fertility patterns across generations is of importance beyond the individual level, as it affects long-term fertility at the macro level if populations increasingly consist of families with high or low fertility (Kolk, Cownden, and Enquist 2014; Murphy and Knudsen 2002).

The objective of this study is to analyse the differences in intergenerational transmission of fertility timing and its underlying mechanisms focusing on two regions in Germany. Germany is characterised by low fertility due to postponement and a relatively high share of childlessness, but no previous research on intergenerational transmission of fertility timing exists. However, some analyses on the effect of family size on the transition to first birth have been conducted for Germany (Fasang 2015; Kotte and Ludwig 2011), as well as on family formation (Van Winkle, Fasang, and Raab 2016). We compare eastern and western Germany due to persisting differences between the two regions in terms of cultural and structural factors as well as in fertility

patterns, and test mechanisms of socialisation, social control, and transmission through socioeconomic status. Our contribution to the ongoing discussion is to use the German context to analyse regional differences in intergenerational transmission of fertility timing and the underlying mechanisms. Furthermore, we close a gap in research by investigating fertility timing instead of completed fertility or fertility patterns, as has been done by Fasang (2015) and Van Winkle, Fasang, and Raab (2016).

Based on data from the German Family Panel (pairfam), we study daughters from two birth cohorts born in 1971–1973 and in 1981–1983 with a sample size of 4,599 women. We focus on women because the transmission effect seems to be stronger among daughters than among sons with different underlying mechanisms (Barber 2001). After providing an overview of the German context and the theoretical background, we use event history analysis to understand intergenerational transmission in an eastern and western German comparison.

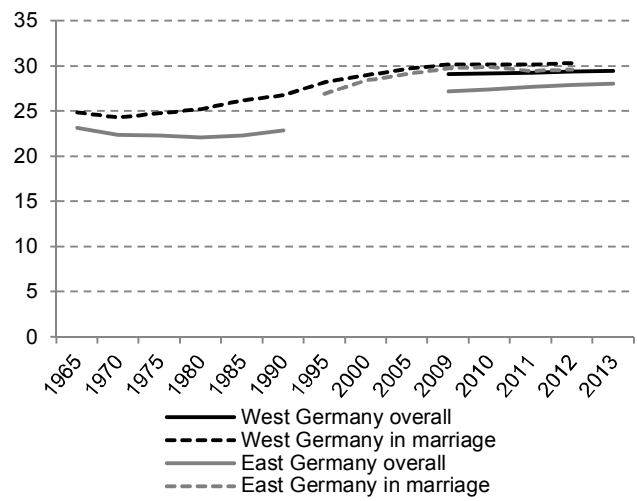
2. The eastern and western German context

The German division into East and West Germany and the subsequent reunification has been considered a natural experiment (Mayer 2006). The Federal Republic of Germany (FRG) and the German Democratic Republic (GDR) were two countries with similar backgrounds, yet characterised by contradictory political and economic systems. Becker, Lois, and Nauck (2010) distinguish between three levels of differences regarding fertility behaviour in eastern and western Germany. Firstly, they display long-term cultural differences between the regions that can be traced back to the time before the separation. Secondly, Becker, Lois, and Nauck (2010) identify indirect influences due to different political systems in the GDR and FRG; these include varying family policies, policies on women's labour force participation, child day care, and parental leave, as well as different attitudes, family models, and the importance of religion. Thirdly, the short-term effects after reunification are defined by a state of shock and economic and social instability in eastern Germany (Becker, Lois, and Nauck 2010). Once this state of shock had been overcome, and the economic situation stabilised, one would have expected eastern and western German fertility behaviours to converge. Instead, about 25 years after reunification, eastern and western Germany still differ in fertility timing, number of children, and the extent of nonmarital childbearing with a younger age of mothers at first birth, a slightly higher cohort fertility, and a considerably higher share of children born out of wedlock in eastern than in western Germany (Pötzsch 2012).

While the GDR's family policies reinforced the compatibility between work and family life and promoted early family formation (Kreyenfeld 2006), FRG's policies

hindered the reconciliation of employment and family life. Having a large family in the GDR resulted in benefits such as priority access to housing, public holiday camps, extra holidays, and fewer working hours for working mothers. The 'marriage loan' may be one of the most significant settlements of the East German policies. According to that, married couples could apply for an interest-free loan of 5,000 East German mark,[3] some of which could be paid off upon having children (Kreyenfeld 2006). Another significant difference between East and West German policies was regulations that addressed the integration of women into the labour market. Beyond that, the East German attitude was characterised by admiration of working mothers, whereas in West Germany, a mother's participation in the labour force was more commonly associated with having negative impacts on children's development (Kreyenfeld and Geisler 2006). These context specific differences between East and West Germany led to diverging life course patterns: very early family formation in East Germany on the one hand, and later and more varied family formation in West Germany on the other (Figure 1).

Figure 1: Mean age at first birth in East and West Germany[4]



Source: Pötzsch 2012.

[3] This sum is roughly the equivalent to half a year of average net earnings at this time (Huinink et al. 1995).
[4] Prior to reunification, age at first birth was recorded only within marriage in official statistics in the former FRG, while in the GDR biological age at childbirth was recorded. After reunification, the FRG practice became the law until 2008. Since 2009, biological age at first birth is recorded in official statistics (legal change).

Analyses based on the two contexts of eastern and western Germany allow us to estimate and compare intergenerational transmission of fertility timing in different contexts. Diverging life course patterns and institutional structures in the two regions (with consistent early childbearing, higher women's and mothers' employment as well as higher rates of nonmarital childbearing in eastern Germany) indicate that the transmission of family timing across generations might differ. Using three different datasets, it has been shown that intergenerational transmission of family size and family formation is more pronounced in western Germany, while it is essentially non-existent in eastern Germany – concluding that transmission of fertility is absent under a communist regime and in post-communist eastern Germany (Fasang 2015; Raab 2017; Van Winkle, Fasang, and Raab 2016). Relatedly, Engelhardt, Trappe, and Dronkers (2002) found differences in the strength of intergenerational transmission of divorce with lower effects in eastern than in western Germany. In addition, Dronkers and Härkönen (2008) reported contextual differences for cross-national variation in intergenerational transmission of divorce.

3. Potential mechanisms: Theory and empirical research

The main theories discussed for intergenerational transmission of fertility patterns are based on transmission through (1) socioeconomic status, (2) socialisation, and (3) social control, which is connected to family instability theories. Genetic heritability has been an essential theory used in early intergenerational transmission research, but lost prominence in more recent studies (Anderton et al. 1987; Barber 2001; Bras, Van Bavel, and Mandemakers 2013; Reher, Ortega, and Sanz-Gimeno 2008; Wu and Martinson 1993). These mechanisms vary in their significance due to contextual differences. In the following, an overview of the three potential mechanisms is provided, as well as how these might create different intergenerational transmission patterns in eastern and western Germany.

Firstly, one explanation for continuity of fertility timing across generations is based on intergenerational transmission of status (McLanahan and Bumpass 1988), that is, due to the same social positions, backgrounds, and experiences that parents and children share. Hence, a mother's socioeconomic status could mediate the relationship between mothers' and daughters' timing of childbearing (Barber 2001). In general, mothers' characteristics affect their children's life in various ways. Firstly, a mother's socioeconomic status could affect both her own and her daughter's fertility timing directly (Dahlberg 2015). Secondly, a mother's socioeconomic status could determine her daughter's socioeconomic status, which subsequently influences her fertility timing. Very young mothers, for example, are more likely to have lower income and education

than women who delayed childbearing; therefore a daughter's timing of birth could be a consequence of intergenerational transmission of poverty or socioeconomic status (Manlove 1997). This reflects selection processes that cause the continuing relationship, because parents and children are exposed to similar opportunity structures. Results on this mechanism are contradictory: Although many studies show that socialisation is more important than the transmission of socioeconomic status (Kolk 2014), various studies consider the transmission of socioeconomic status as an explanation as well (Barber 2001; Jennings and Leslie 2012; Rijken and Liefbroer 2009). Some of them find that the transmission of socioeconomic status mediates the relationship between mothers' and daughters' fertility, while others report remaining intergenerational transmission net of socioeconomic status (Booth and Kee 2009; Dahlberg 2013; Murphy and Knudsen 2002; Rijken and Liefbroer 2009).

In the German context, status transmission across generations has been shown to be lower in East than in West Germany (Huinink et al. 1995), and remained lower even after reunification (Pollak 2011). Furthermore, previous research found that in Germany parental education and children's educational mobility mediate the East–West differences in intergenerational transmission of family formation trajectories (Van Winkle, Fasang, and Raab 2016). Therefore, assuming that intergenerational transmission of fertility is driven by the transmission of status across generations, the relationship between parents' and their children's fertility should be weaker in eastern than in western Germany.

Secondly, the idea of childhood socialisation as a mechanism of intergenerational transmission of fertility is based upon parents passing on their norms, attitudes, values, and preferences. This refers to preferences on life course, family size, and fertility timing (Kolk 2014). Parent–child interaction in early childhood socialises children to judge and behave similarly to their parents; they internalise parental expectations and attitudes and see them as role models (De Valk and Liefbroer 2007). Thus, childhood socialisation can have a direct effect on fertility, but also an indirect effect through other preferences that promote or compete with childbearing. In this context, one assumption is that a daughter's age at first birth is a direct consequence of the reproduction of her mother's age at first birth (Barber and Axinn 1998; Barber 2001). However, socialisation is commonly measured indirectly, for example when the origin family size is used to capture preferences for small or large families. All decisions over the life course can either favour or compete with childbearing (Barber 2000; Manlove 1997). Therefore, preferences other than number of children that are passed on can indirectly influence children's childbearing. Parents whose preferences lie with career and education encourage a postponement of their child's childbearing. Simultaneously, stronger family preferences have the opposite effect (Barber 2000). Evidence for the socialisation theory comes from De Valk and Liefbroer (2007), who find that in the

Netherlands, parental timing preferences are strongly related to their children's preferences, yet these vary by parents' religious background and education. Kolk (2014) supports this notion by stating that intergenerational transmission in Sweden is primarily due to the transmission of values and preferences. Likewise, Reher, Ortega, and Sanz-Gimeno (2008) imply a transmission of values, attitudes, and preferences rather than biological reasons for the found intergenerational transmission.

Intergenerational transmission of fertility has been shown to be stronger in societies or among groups with strong family influences (Engelhardt, Trappe, and Dronkers 2002; Murphy and Knudsen 2002), and for higher-parity families (Booth and Kee 2009). For the East–West German comparison, that means that even though the total fertility rate was higher in East Germany, higher parities were less common in East than in West Germany (Goldstein et al. 2010; Kreyenfeld 2004). Further, it has been shown that the transmission of values underlying family formation is stronger in more religious contexts like West Germany (De Valk and Liefbroer 2007; Van Winkle, Fasang, and Raab 2016). Assuming that value transmission in light of higher parity births and higher religiosity is stronger in western than eastern Germany implies that intergenerational transmission of fertility is stronger in western Germany as well.

A third mechanism of intergenerational transmission is social control. The underlying assumption here is that the degree to which parents are able to control their children's dating and sexual behaviour affects children's timing of childbearing (Barber 2001). This theory is mainly used for adolescents and teenage fertility and independent of preferences. Central to this hypothesis is that two-parent families have better opportunities to supervise and control their children than single-parent families do (Wu and Martinson 1993). It also refers mainly to children still living in the household of their parents. Moving out of the parental household reduces parental control, and as a consequence the effect of a mother's age at birth could be mediated by the age at moving out of the parental home. Little current research on intergenerational transmission is able to capture the parental supervision aspect related to the social control theory. Nevertheless, Hogan and Kitagawa (1985) report a strong mediating effect of parental control of dating behaviour on adolescent pregnancies of black women in the United States.

East Germany was characterised by earlier and longer day care opportunities for children, and consequently by higher maternal employment. Single parenthood was more prevalent in East than in West Germany, having less of a stigma attached to it. Additionally, young adults left the parental home earlier in East than in West Germany (Silbereisen, Schwarz, and Rinker 1995). A recent study shows that children from non-traditional family structures display an earlier family formation compared to children who were raised by two biological parents, but that this association is less pronounced in East Germany compared to West Germany (Raab 2017). This could indicate that

social control was somewhat lower in East than in West Germany, again implying a lower transmission effect.

A complete distinction between these mechanisms is difficult due to overlaps and operationalisation issues. While the socioeconomic transmission theory is distinguishable from the socialisation and social control theories, the latter two are not. This is because the same characteristics of mothers who influence their ability to socialise also affect their ability to control their children (Barber 2001). For example, a large family size can lead to early childbearing of daughters because of socialised preferences or because of a mother's inability to supervise a large number of children (Barber 2001). Typically socialisation is a requirement for social control; social control techniques are insignificant if a child is not socialised to value their mother's approval (Barber 2000). However, they form at different life stages; socialisation typically starts in early childhood, whereas social control only becomes an effective means of fertility control during adolescence (Wu and Martinson 1993).

4. Data, variables, and method

4.1 Data

The analyses are based on data from the first five waves of the German Family Panel (pairfam), release 5.0 (Nauck et al. 2014). A detailed description of the survey can be found in Huinink et al. (2011). The sample of pairfam's anchor dataset is based on pairfam wave 1 to 3 and its East German supplement DemoDiff wave 1 and 2. A combination of wave 1 of pairfam (2008/2009) and DemoDiff (2009/2010) forms the master sample of 13,891 respondents. The German Family Panel suffered from some panel attrition and stabilised quite late compared to other surveys; however, the panel attrition does not seem to bias the sample (Müller and Castiglioni 2015). The partnership and fertility event history dataset provided by pairfam is the basis of this analysis (Schnor and Bastin 2014), which contains the first three waves of pairfam and DemoDiff. Therefore, this analysis' observation period ends with wave 3 in 2010/2011, but the sibling information collected in wave 5 is additionally used when a mother's age at first birth is analysed for robustness checks. We focus on mothers and daughters because the relationship of intergenerational transmission differs in strength and underlying mechanisms by gender (Barber 2001). Additionally, the youngest cohort born between 1991 and 1993 is excluded due to the limited time in which births can be observed. Consequently, those and other selections due to missing information result in a sample size of 4,599 women of the birth cohorts 1971–1973 and 1981–1983. Note that the women of the older birth cohorts were transitioning to adulthood when the wall

came down and were thus strongly affected by the collapse of state socialism in East Germany. All these women made their fertility decisions mainly after German reunification.

4.2 Dependent variable

To examine the transition to first birth, the event variable takes the value one when the event of having a first child occurred during the process time. In accordance with the reproductive phase of women, the process time starts at age 15 and ends at age 40, due to the observation period of the data. Data is censored if the event does not occur, respondents die, or withdraw from the survey prior to having a first child. For piecewise constant models, a baseline needs to be calculated, which depends on the process time. The baseline is included as a categorical variable and consists of four age groups (15–19, 20–24, 25–29, 30–40); in each of these age groups the baseline hazard is assumed to be constant. This hazard rate is a measure for intensity and indicates the risk of having a first birth.

4.3 Independent variables

A mother's age at her daughter's birth is the main independent variable included in the analysis and needs to be constructed from the dates of birth of the mother and of the respondent, since the age of the mother at birth was not explicitly asked during the survey. Generally, a mother's age at first birth is used; to construct this age, the siblings' dates of birth need to be considered as well. However, for the first three waves of pairfam it is not possible to calculate a mother's age at first birth, since the sibling module only covers the number of siblings, and not their age. We argue that our measure of a mother's age at her daughter's birth is a good alternative to a mother's age at first birth. Firstly, mother's age at her daughter's birth and mother's age at first birth are highly correlated with a Pearson coefficient of 0.72. Secondly, a mother's age at first birth implies that later born daughters are compared to their mother's age at their sibling's birth. Results might be different when a mother's specific age at her daughter's birth is taken into account instead. In light of more extended birth spacing, daughters might be affected just the same or even more by their mothers' age at their own birth. This argument is based on the idea that children observe their mothers' age directly as they grow up and not relative to their siblings' age. This implies that we do not measure intergenerational transmission of age at first birth per se, as the observed daughters in our sample can be second, third, or later born as well. However, with wave

5 the sibling module was extended and information on a mother's age at first birth became available for the respondents of that wave. Robustness checks have been conducted for the mothers' age at first birth. For missing values on the mothers' month of birth, the category midyear is used, yet most cases with missing values on month of birth also lack information on year of that mother's birth, and are therefore excluded from the analysis. The mother's age at her daughter's birth has been categorised in the following age groups: under 20, 20–24, 25–29, 30–34, and 35–50. However, a categorisation using the variation in mothers' age (youngest 25%, middle 50%, and oldest 25%) has been used for the Kaplan–Meier estimates.

Education is used as a control variable, categorised as low, medium, or high education. This categorisation is based on a combination of the highest school degree and highest vocational degree (Table A-1). Highest school degree has three categories: lower, intermediate, and higher. Respondents without a degree, other degree, and lower secondary education (*Hauptschulabschluss* or eighth- or ninth-grade polytechnic secondary school, *Polytechnische Oberschule*, in the GDR) are located in the lower school degree category. A high school diploma and the completion of the tenth grade of polytechnic secondary school in the GDR are considered intermediate school degrees. A university of applied sciences entrance qualification and a higher education entrance qualification (*Fachhochschulreife* and *Hochschulreife*) are classified as a higher school degree. Highest vocational degree is divided into six categories: in school, no vocational degree, lower, middle, higher, and university/doctorate degree. A lower vocational degree includes apprenticeships (*Lehre*), a medium vocational degree includes professional and technical schools (*Fachschule* and *Berufsfachschule*), and a higher vocational degree includes college and school for officials (*Beamtenschule* and *Fachhochschule*). Although the age at graduation is not available, typical ages of finishing a certain degree in Germany are assumed to hold true according to Sieben, Huinink, and De Graaf (2001) to include this variable as time-varying (Härkönen 2014; Schneider 2008). A mother's education is measured through that same combination of highest school and highest vocational degree, but time-constant. The combination of highest school and highest vocational degree additionally reduces the number of missing values in this variable. However, because the respondents were asked about their parents' educational and vocational degrees, the number of missing cases remains quite high in this variable with 41%.

Furthermore, the covariate for region is based on the retrospective 'country of birth' variable measured in wave 1, as well as on the question if respondents are 'currently living in East or West Germany' in wave 1 to 3. German-born individuals

were coded as either West or East German, while respondents born outside of Germany were assigned to the region they were living in at wave 1.[5]

The time-varying variable marital status is based on the combination of the variables marriage and cohabitation status leading to three categories: not in a union (single and non-cohabiting), cohabiting union (nonmarital cohabitation), and married.

Control variables for cohort (1971–1973 and 1981–1983), migration background (no migration background, migration background including first and second generation, and missing), religion (Christian, other religion, no religion, and missing), and number of siblings (no siblings, one, two, three, and more siblings, and missing) are also included. Age at moving out of the parental home is calculated to the month and included as a time-varying dichotomous variable that differentiates between 'still living at home' and 'moved out.' In addition, a dummy variable is constructed that measures whether the respondent lived with both biological parents until age 18 or not. This control variable uses information from questions whether the respondent was living with their biological parents after birth and if that living arrangement had changed by age 18.

Overall, religion and number of siblings are used as proxies for socialisation, since pairfam does not cover attitudes and values for both the parent and the child generation. Number of siblings indirectly reflects family size preferences, while religious affiliation is argued to increase potential value transmission across generations. To get a better hold of social control as a mechanism, markers of the transition to adulthood are taken into account. These include age at moving out of the parental home, marital status to control for entering into partnerships, and living with both parents up to age 18. The latter variable is used as a proxy to measure the stability of the parents' relationship as well as their ability to control their child according to social control theory. To test the mechanism of a transmission through socioeconomic status, a mother's education is entered into the analysis. A summary of the variables can be found in Table 1.

[5] We further assessed whether respondents moved between East and West Germany over the years covered by the three waves. However, only 4% of our sample moved from East to West Germany and only 3% moved from West to East Germany. Therefore, we decided to use region of birth rather than a time-varying region variable.

Table 1: Descriptive statistics

Variable	Person months	%
Mother's age at daughter's birth		
Under 20	24,016	13.13
20–24	68,966	37.70
25–29	49,354	26.98
30–34	28,266	15.45
35–50	12,322	6.74
Mother's education		
Lower	72,077	39.40
Intermediate	23,775	13.00
Upper	11,764	6.43
Missing	75,308	41.17
Region		
West Germany	121,831	66.60
East Germany	61,093	33.40
Birth cohort		
1971–1973	122,276	66.85
1981–1983	60,648	33.15
Migration background		
No migration background	135,401	74.02
Migration background	42,617	23.30
Missing	4,906	2.68
Education		
Lower	73,669	40.27
Medium	84,590	46.24
Higher	23,386	12.78
Missing	1279	0.71
Siblings		
No siblings	36,246	19.81
One	76,568	41.86
Two	37,841	20.69
Three and more	31,978	17.48
Missing	291	0.16
Religion		
Christian	108,650	59.40
Other religion	8,752	4.78
No religion	65,191	35.64
Missing	331	0.18

Table 1: (Continued)

Variable	Person months	%
Living with parents up to age 18		
No	36,118	19.74
Yes	107,410	58.72
Missing	39,396	21.54
Moved out		
Still home	43,892	23.99
Moved out	131,136	71.69
Missing	7,896	4.32
Marital status		
Single, non-cohabiting	80,255	43.87
Nonmarried cohabitation (single or divorced)	35,442	19.38
Married	67,227	36.75
Total	182,924	
N	4,599	

Source: Pairfam wave 1–3 and DemoDiff wave 1–2/3, own calculations.

4.4 Method and analytical strategy

We estimate piecewise constant event history models to determine the transition to first birth. The baseline hazard of this model illustrates the time dependency on age and is parameterised by decomposing it into various constant parts. An advantage of this method is that no specific assumptions about the time-dependence of the process are necessary (Blossfeld 2010), in addition to its flexibility and adaptability. In a first step, Kaplan–Meier (KM) survival curves were estimated for a descriptive overview. In a second step, piecewise constant models for all of Germany are examined. In order to estimate the differences in the intergenerational transmission in eastern and western Germany, an interaction term for region and a mother's age at her daughter's birth was introduced into the model. Furthermore, the control and mechanism variables have been added stepwise into the model to capture possible explanations of the transmission effect. If the previously discussed mechanisms – and the used measures for them – explain intergenerational transmission, then the effect of a mother's age at her daughter's birth should disappear. Finally, interaction terms for region and the

mechanism measures [6] are included in separate models to account for different explanations in eastern and western Germany.

5. Results

The KM survival estimates for the transition to first birth by a mother's age at her daughter's birth are shown in Figure 2. The categorisation shows very clear differences in daughters' transition to motherhood by their mothers' age at her birth in western Germany, yet the differences are less visible in eastern Germany. In line with previous research, daughters of the youngest mothers had their first child earlier than daughters of the oldest mothers in both regions. The medium 50% age group is closer to the oldest mothers, indicating that young motherhood in particular seems to influence their daughters. The KM survival curves suggest a somewhat more pronounced intergenerational transmission in western than in eastern Germany.

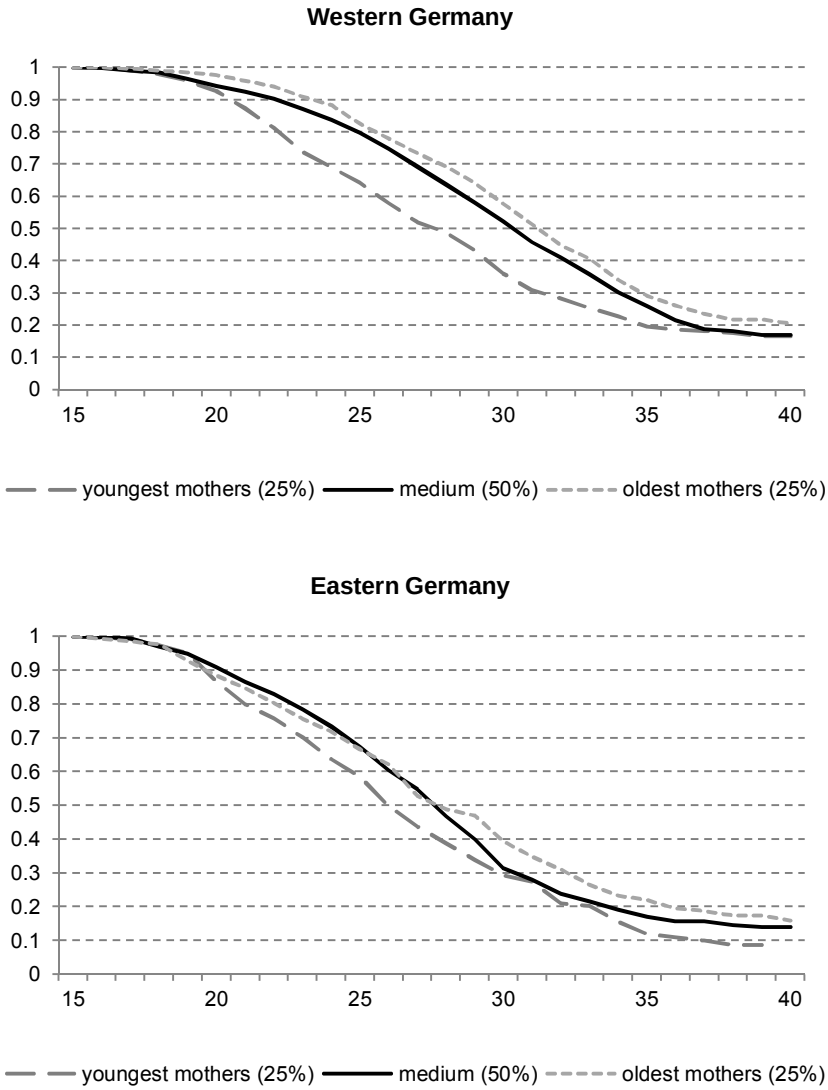
The median ages for a daughter's transition to motherhood – comparing the youngest and oldest mothers – differ by four years in western Germany (youngest mothers: 27, medium: 30, oldest mothers: 31). In eastern Germany this difference amounts to only two years (youngest mothers: 26, medium: 27.5, oldest mothers: 28). The variation by a mother's age is slightly higher when a mother's age at first birth is considered instead of the age at her daughters' birth – five years in western Germany and three years in eastern Germany (see Appendix Figure A-1).

Table 2 shows the relevant results of the piecewise constant analysis using a mother's age at her daughter's birth (full models in Appendix Table A-2).[7] Models 1 and 2 show the initial effect of eastern and western Germany and a mother's age at her daughter's birth, and Models 3 to 9 include the interaction term of these two variables. These models also display the mechanism variables included stepwise. Models 10 to 15 each include an additional interaction term between the region in Germany and the different variables capturing mechanisms.

[6] Mechanism variables: mother's education, number of siblings, religion, lived with both parents until age 18, moved out, and marital status.

[7] All models have been conducted with a mother's age at first birth as well. The results are very similar with a slightly more pronounced effect for the intergenerational transmission of fertility timing in western Germany.

Figure 2: KM survival estimates for transition to first birth by mother's age at daughter's birth, western and eastern Germany (cohorts: 1971–1973, 1981–1983)



Source: Pairfam wave 1–3 and DemoDiff wave 1–2/3, own calculations.

In examining whether intergenerational transmission can be found in eastern and western Germany, the results point to a transmission of fertility timing between mothers and daughters primarily in terms of young parenthood under the age of 25 in western Germany. This means that daughters whose mothers were younger than 25 have a significantly higher likelihood of having a first birth earlier than daughters of older mothers in western Germany. Daughters of mothers that were 25 years and older do not show differences in their transition to first birth. While overall women in eastern Germany are more likely to transition to motherhood than western German women, the interaction effect depicts only marginal differences in the effect of a mother's age on her daughter in the two regions (Model 3). The results indicate a slightly weaker effect of mothers' age on their daughters' age at childbearing for eastern compared to western Germany, particularly among daughters of very young mothers. Consequently, if intergenerational transmission of fertility timing is stronger in western Germany, it is unlikely to bring about the still prevailing differences in age at first motherhood between both parts of the country.

In order to investigate the underlying mechanisms, various independent variables are included stepwise to observe the change in the effect of a mother's age on her daughter's transition to first birth (Models 5–9). In order to examine whether socioeconomic status transmission can explain the fertility transmission, controlling for the mother's education reduces the impact of a mother's age on her daughter's transition to motherhood only negligibly in western Germany (Model 5). Hence, in these models, intergenerational status transmission cannot explain the fertility transmission – bearing in mind, however, that the high number of missing data in this category could be accountable for this result. It also indicates that having a higher educated mother leads to a reduced risk of first birth.[8] However, this relationship disappears when the daughter's own education is included, pointing to a close interrelation between the parents' and children's education (Table A-2, Model 6).

Controlling for the socialisation proxies – number of siblings and religion – does not reduce the effect of a mother's age at her daughter's birth and therefore does not explain the intergenerational transmission in this analysis either (Model 7). Including these covariates, however, still improves the model fit significantly since growing up with three or more siblings has a large positive impact on daughters' transition to motherhood (Kotte and Ludwig 2011). Usually, the remaining effect of a mother's age on her daughter's fertility is interpreted to be due to socialisation. That implies that controlling for socialisation aspects should reduce the effect of a mother's age to some extent, which in this model they do not. This could either be due to other mechanisms

[8] When additionally controlled for the father's education, it seems that a higher education of the father in particular is associated with a later transition of a daughter to first motherhood. The effect of a mother's age at her daughter's birth does not change by including the father's education in the analysis.

that better explain the effect of a mother's age on her daughter's transition to parenthood, or it otherwise indicates that the measures used are insufficient to reflect socialisation; instead, actual information describing the mother's and daughter's values, norms, and preferences is necessary.

Whether and when women moved out of the parental home and whether they lived with both parents until age 18 is used to test for mechanisms underlying social control (Model 8). Results show that moving out of the parental home earlier increases the risk of a first birth significantly. The relationship weakens when marital status is included, pointing out that leaving the parental home is also associated with cohabiting/marrying earlier, but the effect remains high and significant (Table A-2, Model 9). Having lived with both parents until the age of 18 decreases the risk of a first birth slightly once marital status is accounted for. However, a mother's age at her daughter's birth is again only minimally affected by adding these covariates. The relationship between mothers' and daughters' timing of fertility cannot be explained by moving out of the parental home or the presence of both parents up until age 18, so according to these models the transmission of fertility timing cannot be explained through social control theory.

The intergenerational transmission of fertility timing can be explained partly by the daughters' age at entering cohabitation and marriage. The effect of a mother's age at her daughter's birth on that daughter's first birth in western Germany clearly decreases when marital status is introduced to the model (Model 9). Hence, a younger age of the mother does lead to a younger age of the daughter at first birth partly because these daughters cohabit or marry earlier as well. Having a young mother therefore not only seems to affect a daughter's age at first birth, but also leads to daughters leaving the parental home earlier as well as to cohabiting/marrying earlier. This might indicate that a mother's age at her daughter's birth is related to a sequence of events in her daughter's life, which has additionally been tested by further event history models that examine leaving the parental home and timing of cohabitation/marriage. All these models suggest that a younger mother leads to younger ages of daughters when moving out, cohabiting or marrying, and childbearing (not shown). The effect of a mother's age on these events remains largely stable after including all covariates. The median ages for the transitions to moving out, marriage, and first motherhood by a mother's age suggest a somewhat accelerated sequence of events for daughters of the youngest mothers in western Germany only (Table A-3).

Table 2: Results of the piecewise constant analysis for daughter's transition to first birth, Germany

Variable	M1	M2	M3	M4	M5	M6	M7	M8
Mother's age at daughter's birth								
Under 20	1.57***	1.51***	1.65***	1.61***	1.58***	1.53***	1.52***	1.49***
20–24	1.25***	1.21***	1.26***	1.25***	1.23***	1.22***	1.23***	1.20***
25–29	1	1	1	1	1	1	1	1
30–34	0.91	0.92	0.91	0.90	0.90	0.90	0.89	0.87*
35–50	1.07	1.08	1.15	1.13	1.12	1.12	0.99	1.02
Region								
West Germany		1	1	1	1	1	1	1
East Germany		1.27***	1.38***	1.41***	1.42***	1.42***	1.49***	1.40***
Region * mother's age at daughter's birth								
East Germany and under 20			0.80*	0.85	0.86	0.90	0.92	0.95
East Germany and 20–24			0.90	0.93	0.95	0.97	0.97	1.01
East Germany and 25–29			1	1	1	1	1	1
East Germany and 30–34			1.07	1.07	1.07	1.08	1.06	1.13
East Germany and 35–50			0.78	0.77	0.77	0.77	0.83	0.81
Age	✓	✓	✓	✓	✓	✓	✓	✓
Migration background				✓	✓	✓	✓	✓
Cohort				✓	✓	✓	✓	✓
Mother's education					✓	✓	✓	✓
Daughter's education						✓	✓	✓
Number of siblings							✓	✓
Religion							✓	✓
Lived with both parents until age 18								✓
Moved out								✓
LR-test		36.31***	6.19	45.05***	8.65*	34.75***	63.99***	773.46**
N	4,599	4,599	4,599	4,599	4,599	4,599	4,599	4,599

Table 2: (Continued)

Variable	M9	M10	M11	M12	M13	M14	M15
Mother's age at daughter's birth							
Under 20	1.27***	1.28***	1.26***	1.28***	1.27***	1.26***	1.26***
20–24	1.15**	1.16**	1.15**	1.15**	1.15**	1.15**	1.14**
25–29	1	1	1	1	1	1	1
30–34	0.99	0.99	0.99	0.99	0.99	0.99	0.99
35–50	1.05	1.04	1.05	1.04	1.05	1.05	1.04
Region							
West Germany	1	1	1	1	1	1	1
East Germany	1.39***	1.46***	1.27**	1.21*	1.66***	1.24*	0.94
Region * mother's age at daughter's birth							
East Germany and under 20	0.90	0.89	0.91	0.89	0.90	0.91	0.92
East Germany and 20–24	0.94	0.93	0.95	0.94	0.94	0.94	0.96
East Germany and 25–29	1	1	1	1	1	1	1
East Germany and 30–34	1.02	1.02	1.02	1.03	1.02	1.01	1.02
East Germany and 35–50	0.94	0.96	0.94	0.96	0.95	0.94	0.93
Age	✓	✓	✓	✓	✓	✓	✓
Migration background	✓	✓	✓	✓	✓	✓	✓
Cohort	✓	✓	✓	✓	✓	✓	✓
Mother's education	✓	✓	✓	✓	✓	✓	✓
Daughter's education	✓	✓	✓	✓	✓	✓	✓
Number of siblings	✓	✓	✓	✓	✓	✓	✓
Religion	✓	✓	✓	✓	✓	✓	✓
Lived with both parents until age 18	✓	✓	✓	✓	✓	✓	✓
Moved out	✓	✓	✓	✓	✓	✓	✓
Marital status	✓	✓	✓	✓	✓	✓	✓
Region * mother's education		✓					
Region * no of siblings			✓				
Region * religion				✓			
Region * moving out					✓		
Region * both parents						✓	
Region * marital status							✓
LR-test	2931.74**	4.44	5.18	12.26**	2.54	2.08	81.67***
N	4,599	4,599	4,599	4,599	4,599	4,599	4,599

*Note:*** p<0.01, ** p<0.05, * p<0.1.
Source: Pairfam wave 1–3 and DemoDiff wave 1–2, own calculations.

Finally, interaction terms between region and various variables accounting for the mechanisms have been included in the models (Models 10–15). None of these interaction effects explain or change the effect of a mother's age at her daughter's birth on her own transition to first birth in eastern or western Germany. Only two of the interaction effects improve the model fit and therefore add to the model: the interaction between religion and region, and between marital status and region. The interaction with religion shows that, in eastern Germany, women who say they are not religious are more likely to have a first child than nonreligious women in western Germany. While in western Germany Christian women display a higher transition rate than other women, religion does not seem to matter in eastern Germany (Table A-2, Model 12). Married western German women are considerably more likely to transition to first motherhood than single women or women in nonmarital cohabitation, while in eastern Germany women who are not married have a much higher likelihood of a first birth than their western German counterparts (Table A-2, Model 15). This indicates the decoupling of marriage and parenthood in eastern Germany and the still widespread child-centred marriage in western Germany (Goldstein et al. 2010). However, these interaction effects do not suggest differences in mechanisms that would explain the transmission of early parenthood in the two regions.

Consequently, intergenerational transmission of fertility timing was shown for early childbearing in western Germany; this relationship seems to be less pronounced in eastern Germany. Part of the explanation could be that the transition to adulthood (moving out of the parental home and starting a cohabitation/marriage) starts somewhat earlier in eastern than in western Germany, independent of a mother's age. This also means that the more standardised life course in eastern Germany led to less variation and, therefore, fewer possibilities to be influenced by family background and that this pattern partly persisted even for younger cohorts after reunification. In western Germany, a mother's age above 25 is not significantly associated with her daughter's transition to first birth. This suggests that the transmission effect is limited to childbearing below the normative ages in particular. Having a first birth in their late twenties is nowadays the norm in western Germany, whereas earlier childbearing remains more prevalent in eastern Germany, partially as a result of greater social acceptance.

6. Conclusion

Our analysis of Germany shows evidence for intergenerational transmission of young childbearing between mothers and daughters for the cohorts 1971–1973 and 1981–1983. Comparing eastern and western Germany revealed a weaker effect in eastern

Germany, which may be caused by standardised life courses in eastern Germany that reduce intergenerational transmission of fertility timing. It appears that institutional transformation does not override established normative life course patterns entirely since younger cohorts in eastern Germany have not yet adopted the same patterns of intergenerational transmission as in western Germany. Consequently, we were able to confirm an intergenerational transmission effect of early childbearing for western and a mitigated effect for eastern Germany. This result complements previous research indicating a lack of intergenerational transmission for family size and family formation patterns in East Germany under the regulative regime of state socialism and thereafter (Fasang 2015; Van Winkle, Fasang, and Raab 2016), and adds to the knowledge that differences in the transmission of fertility timing are not as large as other family outcomes that have been studied before.

Concerning the underlying mechanisms, socioeconomic status reduces the effect of a mother's age on her daughter's first birth only minimally and is further largely explained by that daughter's own education. Therefore, a transmission of socioeconomic status cannot be confirmed as a mechanism. Social control has to be rejected likewise in the presented analysis since a daughter's age at moving out, as well as living with both parents until age 18, did not fully explain the relationship between a mother's and her daughter's fertility timing. Further, our analyses suggest that the remaining effect of a mother's age on her daughter's transition to first birth cannot completely be ascribed to the socialisation measures used. Our proxies for socialisation – number of siblings and religious affiliation – failed to explain the relationship between a mother's and her daughter's fertility. However, a large part of the remaining effect of a mother's age on her daughter's transition can perhaps be attributed to preference-, norm-, and value consistencies that we are not able to include here. That only childbearing ages below the norm are transmitted could indicate a socialisation effect as well. It may be worth, however, to consider additional mechanisms that might explain the continuity between generations, instead of inferring that the remaining impact of a mother's age is entirely due to socialisation. Nonetheless, our results show that some of the relation in age at birth between mothers and daughters is actually due to an association with union formation in eastern and western Germany. The results indicate that a mother's young age at birth not only leads to a younger daughter when entering motherhood, but also to a younger daughter when moving out and when starting a cohabitation or marriage. Although we cannot state the order of the events, it could be suggested that the whole sequence of events for the transition to adulthood (excluding employment) is antedated for daughters of particularly young mothers. This result is consistent with previous research showing intergenerational transmission of demographic trajectories in spite of social change (Liefbroer and Elzinga 2012).

One limitation of the analysis at hand is a high number of missing data for a mother's age at first birth, since it can only be based on wave 5 of the German Family Panel, and thus suffers from panel attrition. Therefore, a mother's age at first birth was only used as a robustness check. Similarly, the missing data for a mother's education is problematic; 41% of the data for mothers' education is missing, which restricts the conclusions drawn on socioeconomic status transmission as a mechanism. Another limitation in this context is the operationalisation of socioeconomic status. Pairfam collects information on respondent's parents including occupation and income; however, this information is only available at the time of the interview. To examine a daughter's transition to first birth, however, their parent's information is needed at the time of this transition or in their childhood. Consequently, our conclusions on the transmission of socioeconomic status need to be considered with caution. Finally, no obvious and correct way of operationalising socialisation exists. It is theoretically difficult to define and to measure without data on preferences.

The results presented, however, make three contributions to research on fertility determinants and intergenerational transmission. Firstly, referring to Balbo, Billari, and Mills' (2013) review of fertility determinants, our results confirm the micro-level determinants of intergenerational transmission of behaviour from mothers to daughters at young ages. Based on our data, we cannot verify the effect of the socioeconomic status of the origin family as a fertility determinant. However, when analysing continuity of fertility, one should always have in mind that the two generations being compared live under different circumstances. Fertility depends on other determinants like partnerships, socioeconomic position, and uncertainties, which might create very different situations for the two generations and hinder transmission to a certain extent. Secondly, it has already been shown that the differences in previous policy and welfare measures between East and West Germany led to cross-country variation in fertility and life course patterns prior to reunification. Regional differences between eastern and western Germany were used to show how institutional contexts can mitigate intergenerational transmission of fertility for cohorts entering adulthood after reunification. Thirdly, the results contribute to the literature on regional differences in intergenerational transmission of fertility by focusing on fertility timing instead of family size or family formation trajectories.

In conclusion, intergenerational transmission of fertility timing was found for daughters of young mothers in western Germany, and a slightly weaker transmission was shown for eastern Germany. These findings resonate with previous research indicating that eastern Germans display lower or no intergenerational transmission, yet it is worthwhile to point out that this pattern persists long after the reunification and under changing circumstances. It remains to be seen if eastern Germany will adapt to the western German intergenerational transmission patterns in the long run, or if

regional differences will persist. Finally, the analysis was less insightful in explaining the underlying mechanisms of the transmission effect, which remains an important aspect for future research.

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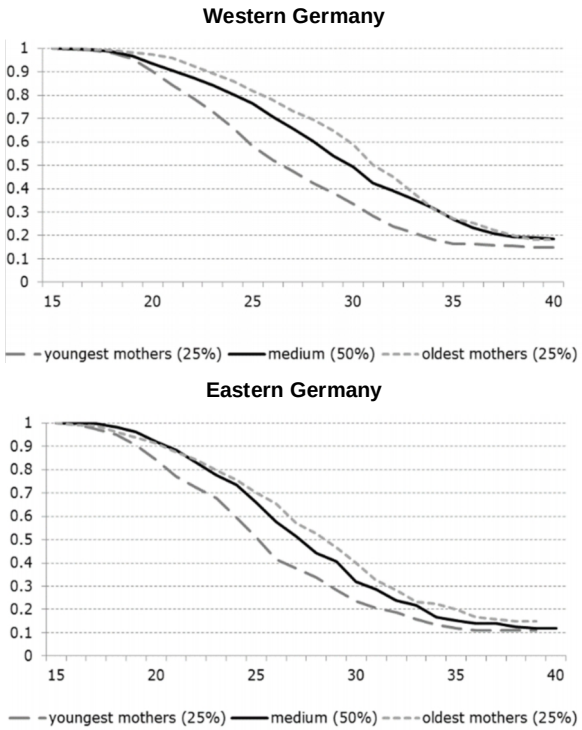
Appendix

Table A-1: Operationalisation of level of education based on highest school and vocational degree

Highest school degree	Highest vocational degree					
	In school	No vocational degree	Lower	Middle	Higher	University/ doctorate
Lower	L	L	L	L	M	M
Intermediate	L	L	M	M	H	H
Higher	M	M	M	M	H	H

Note: L: lower education, M: medium education, H: higher education.

Figure A-1: KM survival estimates for transition to first birth by mother's age at first birth, western and eastern Germany (cohorts: 1971–1973, 1981–1983)



Source: Pairfam wave 1–3 and DemoDiff wave 1–2/3, own calculations.

Table A-2: Results of the piecewise constant analysis for daughter's transition to first birth using mother's age at daughter's birth, Germany

Variable	M1	M2	M3	M4	M5	M6	M7	M8
Mother's age at daughter's birth								
Under 20	1.57***	1.51***	1.65***	1.61***	1.58***	1.53***	1.52***	1.49***
20–24	1.25***	1.21***	1.26***	1.25***	1.23***	1.22***	1.23***	1.20***
25–29	1	1	1	1	1	1	1	1
30–34	0.91	0.92	0.91	0.90	0.90	0.90	0.89*	0.87*
35–50	1.07	1.08	1.15	1.13	1.12	1.12	0.99	1.02
Age								
15–19	0.30***	0.30***	0.30***	0.30***	0.30***	0.25***	0.25***	0.49***
20–24	1	1	1	1	1	1	1	1
25–29	1.79***	1.80***	1.80***	1.79***	1.80***	1.87***	1.86***	1.61***
30–40	2.15***	2.18***	2.19***	2.09***	2.10***	2.17***	2.18***	1.80***
Region								
West Germany		1	1	1	1	1	1	1
East Germany		1.27***	1.38***	1.41***	1.42***	1.42***	1.49***	1.40***
Region * mother's age at daughter's birth								
East Germany and under 20			0.80*	0.85	0.86	0.90	0.92	0.95
East Germany and 20–24			0.90	0.93	0.95	0.97	0.97	1.01
East Germany and 25–29			1	1	1	1	1	1
East Germany and 30–34			1.07	1.07	1.07	1.08	1.06	1.13
East Germany and 35–50			0.78	0.77	0.77	0.77	0.83	0.81
Migration background								
No migration background				1	1	1	1	1
Migration background				1.32***	1.32***	1.31***	1.21***	1.21***
Cohort								
1981–1983				0.91**	0.91**	0.90**	0.90**	1.00
1971–1973				1	1	1	1	1
Mother's education								
Lower					1	1	1	1
Intermediate					0.94	0.95	0.97	0.94
Upper					0.80***	0.83**	0.85*	0.83**
Daughter's education (time-varying)								
Lower						1	1	1
Intermediate						0.76***	0.79***	0.74***
Upper						0.76***	0.81***	0.72***
Number of siblings								
No siblings							1	1
One sibling							0.98	0.98
Two siblings							1.06	1.06
Three and more siblings							1.41***	1.44***
Religion								
Christian							1	1
Other religion							1.22**	1.30***
No religion							0.93	0.88***
Lived with both parents until age 18								
Yes								1.05
No								1
Moved out (time-varying)								
Still home								1
Moved out								5.05***
LR-test		36.31***	6.19	45.05***	8.65*	34.75***	63.99***	773.46***
N	4,599	4,599	4,599	4,599	4,599	4,599	4,599	4,599

Table A-2: (Continued)

Variable	M9	M10	M11	M12	M13	M14	M15
Mother's age at daughter's birth							
Under 20	1.27***	1.28***	1.26***	1.28***	1.27***	1.26***	1.26***
20–24	1.15**	1.16**	1.15**	1.15**	1.15**	1.15**	1.14**
25–29	1	1	1	1	1	1	1
30–34	0.99	0.99	0.99	0.99	0.99	0.99	0.99
35–50	1.05	1.04	1.05	1.04	1.05	1.05	1.04
Age							
15–19	0.80***	0.80***	0.80***	0.81***	0.80***	0.80***	0.79***
20–24	1	1	1	1	1	1	1
25–29	1.15***	1.15***	1.15***	1.15***	1.15***	1.15***	1.16***
30–40	1.06	1.06	1.06	1.06	1.05	1.06	1.06
Region							
West Germany	1	1	1	1	1	1	1
East Germany	1.39***	1.46***	1.27**	1.21*	1.66***	1.24*	0.94
Region * mother's age at daughter's birth							
East Germany and under 20	0.90	0.89	0.91	0.89	0.90	0.91	0.92
East Germany and 20–24	0.94	0.93	0.95	0.94	0.94	0.94	0.96
East Germany and 25–29	1	1	1	1	1	1	1
East Germany and 30–34	1.02	1.02	1.02	1.03	1.02	1.01	1.02
East Germany and 35–50	0.94	0.96	0.94	0.96	0.95	0.94	0.93
Migration background							
No migration background	1	1	1	1	1	1	1
Migration background	1.01	1.02	1.02	1.02	1.02	1.01	1.01
Cohort							
1971–1973	1	1	1	1	1	1	1
1981–1983	1.07*	1.07*	1.07	1.07	1.07	1.08*	1.06
Mother's education							
Lower	1	1	1	1	1	1	1
Intermediate	1.04	0.89	1.05	1.05	1.04	1.05	1.04
Upper	0.94	0.99	0.94	0.95	0.94	0.94	0.95
Daughter's education (time-varying)							
Lower	1	1	1	1	1	1	1
Intermediate	0.71***	0.71***	0.71***	0.71***	0.71***	0.71***	0.71***
Upper	0.70***	0.70***	0.70***	0.70***	0.70***	0.70***	0.71***
Number of siblings							
No siblings	1	1	1	1	1	1	1
One sibling	1.00	1.00	0.95	1.00	1.00	1.00	0.99
Two siblings	1.04	1.04	1.00	1.04	1.04	1.04	1.04
Three and more siblings	1.33***	1.33***	1.28**	1.32***	1.33***	1.34***	1.31***
Religion							
Christian	1	1	1	1	1	1	1
Other religion	0.73***	0.73***	0.73***	0.75***	0.73***	0.74***	0.71***
No religion	0.97	0.97	0.97	0.85**	0.97	0.97	0.96
Lived with both parents until age 18							
Yes	0.91*	0.92*	0.92*	0.91*	0.91*	0.86*	0.92*
No	1	1	1	1	1	1	1
Moved out (time-varying)							
Still home	1	1	1	1	1	1	1
Moved out	1.99***	1.98***	1.99***	1.99***	2.15***	1.99***	1.95***

Table A-2: (Continued)

Variable	M9	M10	M11	M12	M13	M14	M15
Marital status (time-varying)							
Single, no cohabitation	0.05***	0.05***	0.05***	0.05***	0.05***	0.05***	0.04***
Nonmarital cohabitation	0.26***	0.26***	0.26***	0.26***	0.26***	0.26***	0.20***
Married	1	1	1	1	1	1	1
Region * mother's education							
East Germany and lower		1					
East Germany and intermediate		1.21					
East Germany and upper		0.84					
Region * no of siblings							
East Germany and no siblings			1				
East Germany and one sibling			1.12				
East Germany and two siblings			1.10				
East Germany and three + siblings			1.10				
Region * religion							
East Germany and Christian				1			
East Germany and other religion				0.79			
East Germany and no religion				1.35**			
Region * moved out							
East Germany and still home					1		
East Germany and moved out					0.82		
Region * lived with both parents until age 18							
East Germany and yes						1.15	
East Germany and no						1	
Region * marital status							
East Germany and single, no cohabitation							2.27***
East Germany and nonmarital cohabitation							1.94***
East Germany and married							1
LR-test	2931.74***	4.44	5.18	12.26**	2.54	2.08	81.67***
N	4,599	4,599	4,599	4,599	4,599	4,599	4,599

Note: Controlled for missing categories. *** p<0.01, ** p<0.05, * p<0.1.
Source: Pairfam wave 1-3 and DemoDiff wave 1-2, own calculations.

Table A-3: Daughter's median age at moving out, at first cohabitation/marriage, and at first birth by mother's age at her daughter's birth for western and eastern Germany

Mother's age at daughter's birth	Moving out		Cohabitation/marriage		First birth	
	West	East	West	East	West	East
Youngest 25%	20	19	23	21	27	26
Medium	21	20	24	22	30	27.5
Oldest 25%	21	20	24	22	31	28

Source: Pairfam wave 1–3 and DemoDiff wave 1–2, own calculations.